Independent claim 4 sets forth a "method of fabricating at least a ceramic honeycomb body including a multiplicity of cells, the cells having wall thicknesses of 0.125 mm or less, comprising drying at least an extrusion-molded argillaceous honeycomb body by exposing the extrusion-molded argillaceous honeycomb body to a high-humidity ambience of not less than 70 % in humidity; and irradiating the extrusion-molded argillaceous honeycomb body with microwaves having a frequency of 1,000 to 10,000 MHz; wherein drying the extrusion-molded argillaceous honeycomb body is carried out by measuring a temperature of the extrusion-molded argillaceous honeycomb body and controlling supply of the microwaves in accordance with the measured temperature." Claims 2 and 3 depend from and incorporate all of the limitations of claim 4.

Ceramic honeycomb bodies formed by the method set forth in claim 4 provide distinct advantages over ceramic honeycomb bodies formed by conventional methods. In particular, the claimed method allows the prevention of cracking, wrinkling and other defects in the thinner skin portions of the ceramic honeycomb body and avoids problems, such as dielectric breakdown and undesirable discharge, to be avoided. Cracking, wrinkling and other defects in the thinner skin portions of the ceramic honeycomb body result from shrinkage differences caused by differences in drying rates for different portions of a ceramic honeycomb body. *See* Specification, page 1, lines 10-22. The claimed method dries a ceramic honeycomb body by applying a high-humidity environment and heating by irradiating the honeycomb body with microwaves having a frequency of 1,000 to 10,000 MHz.

These advantages are obtained by the claimed method, which produces a ceramic body from a honeycomb structure in which the cells are open at both ends and have a thin wall thickness of 0.125 mm or less. *See* Specification, page 2, lines 3-18. According to the claimed method, the ceramic honeycomb body is dried by microwave irradiation with exposure to a high-humidity ambience of not less than 70% humidity. This combination of

heating by microwave irradiation and high-humidity ambience allows these advantages to be achieved. *See* Specification, page 2, line 19 - page 3, line 26.

Heating by microwave irradiation allows a high-humidity environment to be maintained during the drying process. Conventional high-frequency current methods require electrodes to be placed near the ceramic honeycomb body to be dried, and problems such as discharge and dielectric breakdown between the electrodes can occur in high-humidity environments. *See* Specification, page 3, lines 5-11. Microwaves, as required by claim 4, do not require electrodes and can heat a ceramic honeycomb body in a high-humidity environment. *See* Specification, page 3, lines 12-16. Thus, drying by microwave irradiation, which is heating as a function of direct vibration of water molecules in the ceramic honeycomb body with irradiation of microwaves, can be distinguished from conventional drying techniques based on external heat transmittance or diffusion of water from the ceramic body.

According to the method of claim 4, high-humidity conditions are applied to improve the drying process. *See* Specification, page 2, line 19 - page 3, line 26. In general, heating by microwave irradiation causes water vapor to be released from the surfaces of a ceramic body. Water vapor that is released from the cell walls of the ceramic honeycomb body into the cells is not freely discharged to the atmosphere, which creates high-humidity conditions within the cells. However, in conventional microwave heating techniques, water vapor that is released from the surface of the outer skin portion can be easily discharged into the atmosphere. This free discharge of water vapor from the outer skin portion of the ceramic honeycomb body can cause a difference in drying speed between the interior cell walls and the outer skin portion.

However, the problem of different drying speeds can be overcome by the claimed method of applying high-humidity conditions to the ceramic honeycomb body during microwave irradiation. By maintaining a high-humidity environment during heating by

microwave irradiation, similar conditions in the cells and on the outer skin portion of the ceramic honeycomb body are maintained. Thus, the difference between the drying rates for the outer peripheral surfaces and for the interior of the ceramic honeycomb body can be reduced, and deformation of the outer surface due to drying too quickly can be prevented. *See* Specification, page 2, lines 19-27. In addition, the difference between shrinkage rates of the outer peripheral surfaces and the interior cell walls of the ceramic honeycomb body can be reduced by this method, which may prevent cracking, wrinkling and other defects. *See* Specification, page 2, lines 30-37.

In addition, the claimed method requires that the temperature of the ceramic honeycomb body is monitored during the drying process, and that the microwave supply is controlled. By controlling the supply of microwaves based on the measured ceramic honeycomb body temperature, over-drying can be prevented. *See* Specification, page 4, lines 17-34.

The Office Action takes the position that claim 4, and dependent claims 2 and 3 would have been obvious over Andou, in view of Davidson, Chyung and, optionally, Hallier. Applicants respectfully disagree.

Andou teaches ceramic honeycomb bodies, having partition walls with thicknesses of from 0.05 to 0.13 mm, that are produced by extrusion molding clay rods into honeycomb supports and drying the honeycomb supports. *See* Andou, Abstract, col. 6, lines 35-44. Andou teaches that the honeycomb support is "uniformly heated to evaporate moisture" and thereafter fired. *See* Andou, col. 6, lines 40-44. The Office Action admits that Andou does not teach exposing a ceramic honeycomb body to a high-humidity environment; irradiating a honeycomb body with microwaves, particularly microwaves in a frequency range of from 1,000 to 10,000 MHz; or measuring honeycomb body temperature during drying and

controlling the supply of microwaves heating the honeycomb body, based on the measured temperature.

For at least these reasons, Andou alone cannot support a rejection of claim 4 or its dependent claims. Davidson does not remedy the shortcomings of Andou.

Davidson teaches drying extrudable compositions under high-humidity conditions to avoid over-drying. *See* Davidson, col. 3, lines 55-58. However, Davidson does not disclose or suggest that defects such as wrinkling or cracking in the thinner skin portions of the ceramic honeycomb body can be prevented by drying under high-humidity conditions. *See generally,* Davidson. In Davidson, the atmosphere is controlled under high-humidity conditions that conform with the high-humidity atmosphere within passages of the tube-shaped extrudate to stably control water content of the extrudate surface and thus to avoid over-drying. *See* Davidson, col. 3, lines 55-58.

In contrast, the claimed method requires drying by microwave irradiation in combination with high-humidity conditions to dry ceramic honeycomb bodies without cracking, wrinkling and other defects in the skin portions of the ceramic honeycomb body that may result from shrinkage differences caused by differences in the drying rates of different portions of the ceramic honeycomb body. *See* Specification, page 1, lines 10-22. The claimed method can also avoid problems, such as dielectric breakdown and undesirable discharge. These advantages can be achieved because the ceramic body dried by the claimed method has a honeycomb structure.

Davidson does not teach or suggest such a drying method using high-humidity conditions or the advantages that can be achieved by such a method. *See generally*, Davidson.

In addition, the claimed method's combination of drying with microwave irradiation and drying under the claimed high-humidity conditions is necessary to achieve the advantages

described above, whereas Andou and/or Davidson do not provide any motivation to make use of such a combination. Neither Andou nor Davidson contain any motivation to modify or combine their teachings to provide a method for drying a ceramic honeycomb body in a high-humidity environment as set forth in independent claim 4.

In addition, Davidson, like Andou, does not disclose or suggest irradiating a honeycomb body with microwaves, particularly microwaves in a frequency range of from 1,000 to 10,000 MHz, and does not teach measuring a honeycomb body temperature drying and controlling drying the supply of microwaves heating the honeycomb body, based on the measured temperature, as required by claim 4. *See generally,* Davidson.

For at least these reasons, Andou and Davidson, individually and in combination, cannot support a rejection of claim 4 or its dependent claims. Chyung does not remedy the shortcomings of Andou and Davidson.

Chyung teaches drying thick walled shapes, such as boards, and extruded honeycomb structures by applying microwave radiation. *See* Chyung, Abstract; col. 9, line 67 - col. 10, line 4. However, Chyung does not disclose or suggest drying ceramic honeycomb bodies under high-humidity conditions nor does Chyung disclose or suggest that defects, such as wrinkling or cracking in the skin portions of the ceramic honeycomb body, can be prevented by drying under high-humidity conditions. *See generally,* Chyung. In addition, Chyung, like Andou and Davidson, does not disclose or suggest irradiating honeycomb bodies with microwave radiation in a frequency range of from 1,000 to 10,000 MHz, and does not teach measuring a honeycomb body temperature and controlling the microwave supply based on the measured temperature. *See generally,* Chyung.

For at least these reasons, Andou, Davidson and Chyung, individually and in combination, cannot support a rejection of claim 4 or its dependent claims. Hallier does not remedy the shortcomings of Andou, Davidson, and Chyung.

Hallier discloses pre-drying ceramic pieces, such as porcelain plates, by microwave heating in an atmosphere including humidity from water removed from the ceramic pieces. *See* Hallier, Abstract; col. 2, lines 55-58. Microwaves having a frequency of 2,450 MHz are disclosed as effective for heating porcelain ceramics in drying processes. *See* Hallier, col. 1, lines 8-12. However, Hallier does not disclose or suggest drying honeycomb bodies, or other thin walled structures, under high-humidity conditions or that defects such as wrinkling or cracking in the thinner skin portions of ceramic honeycomb bodies can be prevented by drying under high-humidity conditions. *See generally,* Hallier. Hallier, like Andou, Davidson and Chyung, also does not disclose or suggest measuring the temperature a honeycomb body - or any ceramic structure - during drying and controlling the supply of microwaves heating the honeycomb body, based on the measured temperature, as required by claim 4. *See generally,* Hallier.

For at least these reasons, Andou, Davidson, Chyung and Hallier, individually and in combination, cannot support a rejection of claim 4 or its dependent claims

For at least the reasons set forth above, Applicants respectfully submit that independent claim 4 and dependent claims 2 and 3 are patentable over Andou, Davidson, Chyung and Hallier, individually and in combination. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Claim 5

The Office Action rejects claim 5 under 35 U.S.C. §103(a) over Andou, Davidson, Chyung and Hallier, as applied to claim 4, and further in view of U.S. Patent No. 3,187,574 to Mason et al. or U.S. Patent No. 4,3115,150 to Darringer et al. Applicants respectfully traverse this rejection.

Claim 5 depends from and incorporates all of the limitations of claim 4, which is set forth above.

For at least the reasons set forth above, no combination of Andou, Davidson, Chyung and Hallier would have rendered claim 4, or its dependent claims, obvious. Mason and Darringer cannot remedy the shortcomings of Andou, Davidson, Chyung and Hallier.

Mason and Darringer teach infrared optical pyrometers and thermometers, respectively. Specifically, Mason teaches infrared optical pyrometers that can be calibrated for high and low temperatures and that can be used measure the temperatures of ovens. *See* Mason, col. 1, lines 9-18. However, Mason does not include any teachings relating to humidity conditions inside an oven during heating, relating to the types of bodies heated in an oven, or relating to measuring the temperature of a body within an oven during heating. *See generally*, Mason.

Darringer teaches optical thermometers for determining temperatures of specific areas by measuring infrared radiation from that area. *See* Darringer, Abstract; col. 1, lines 5-11; col. 2, line 53 - col. 3, line 10. However, Darringer does not include any teachings relating to the humidity conditions surrounding the area being measured, relating to measuring the temperature of a body, or relating to types of areas or bodies the temperatures of which could be determined by the infrared thermometer. *See generally*, Darringer.

Because the Mason and Darringer references, like the Andou, Davidson, Chung and Hallier references discussed above, do not teach or suggest "exposing the extrusion-molded argillaceous honeycomb body to a high-humidity ambience of not less than 70 % in humidity; and irradiating the extrusion-molded argillaceous honeycomb body with microwaves having a frequency of 1,000 to 10,000 MHz" or "controlling supply of the microwaves in accordance with the measured temperature [of the extrusion-molded argillaceous honeycomb body]," as set forth in claim 4, Andou, Davidson, Chyung, Hallier, Mason and Darringer, individually and in combination, cannot support a rejection of claim 4, or its dependent claim 5.

Applicants respectfully submit that claim 5 is patentable over Andou, Davidson, Chyung, Hallier, Mason and Darringer, individually and in combination. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

II. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 2-5 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

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